Lockheed Martin

Software Supportability and Maintainability

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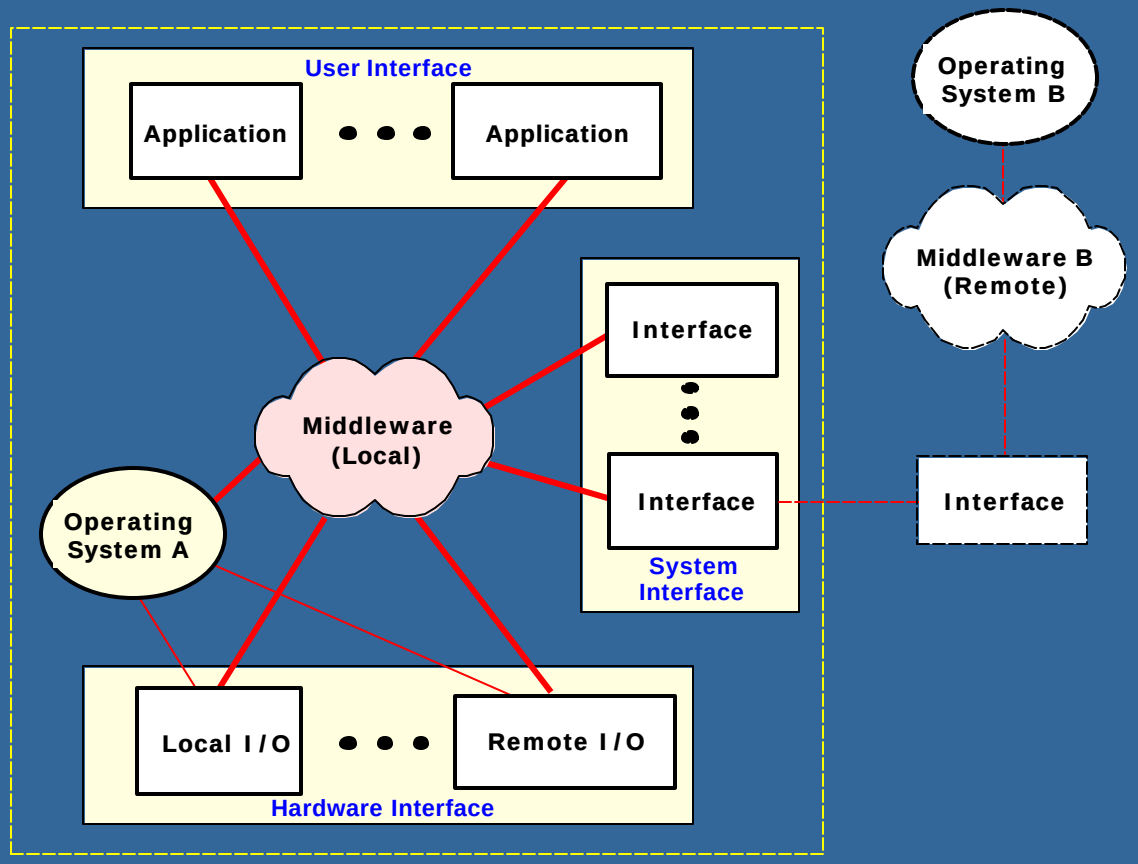
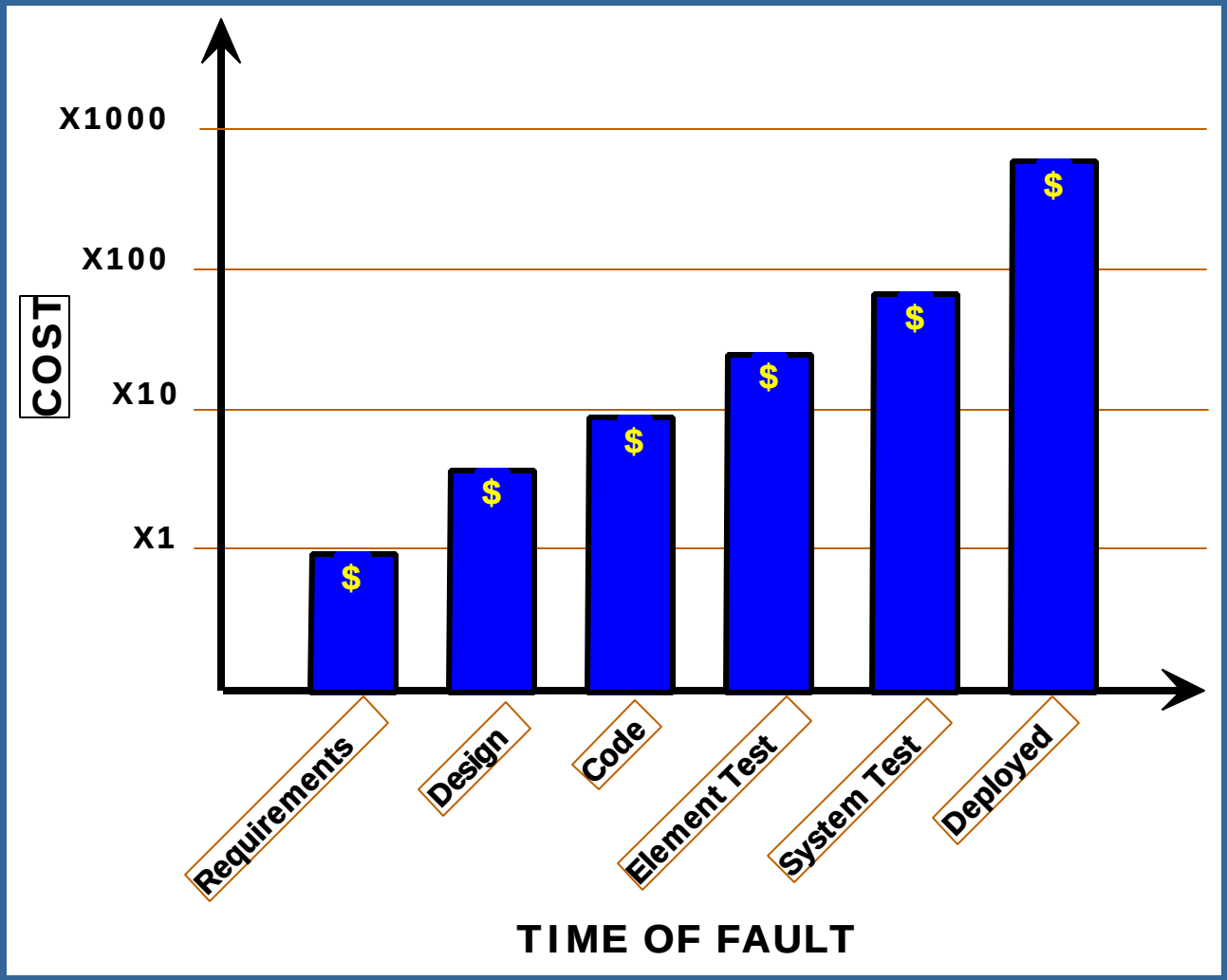
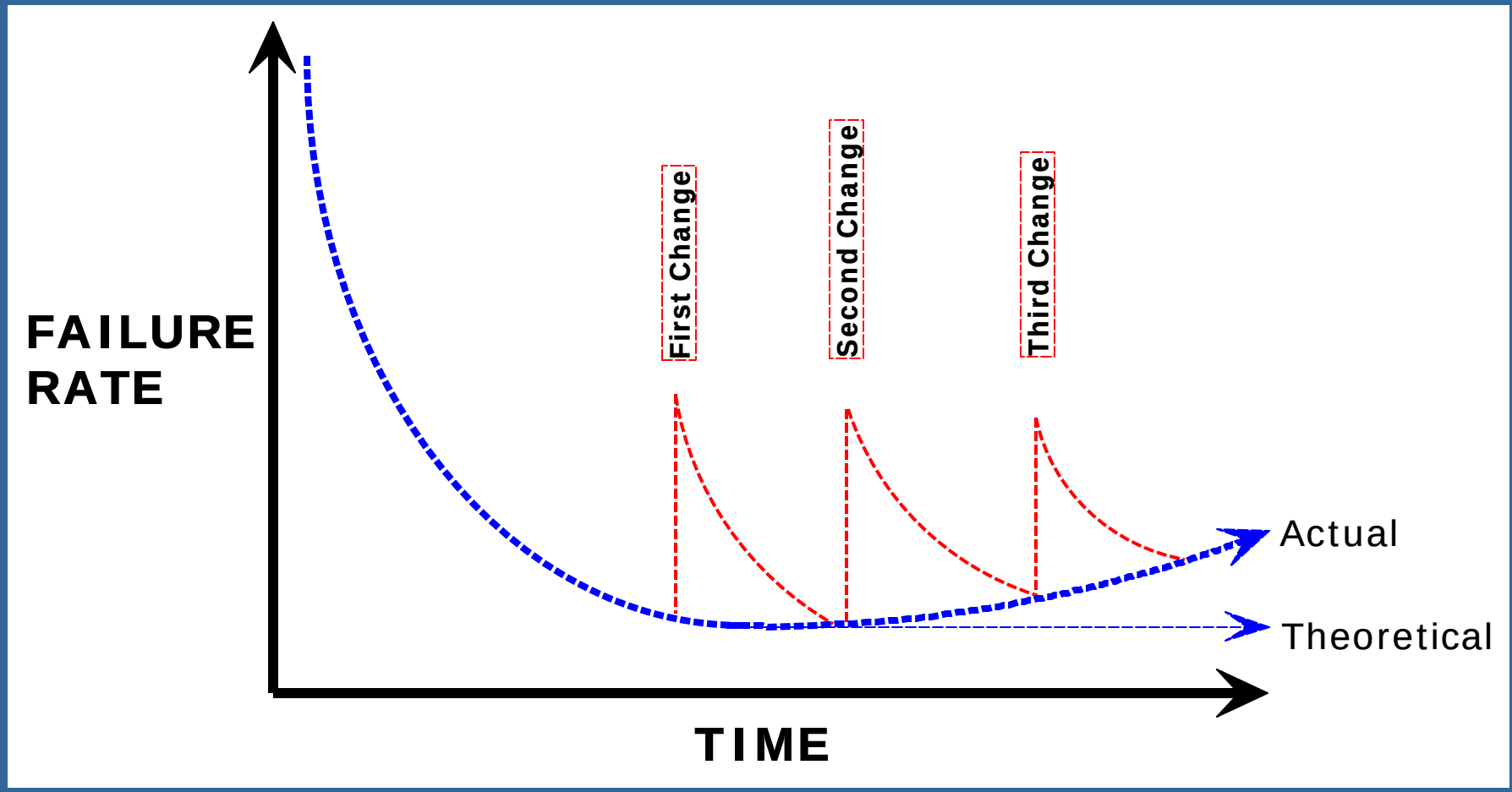
Typical Multitasking Software



Cost of Correcting Faults by Program Phase



Increasing Failure Rate Due to Software Changes



Supportability Issues

- **Configuration Management**
- **Diminishing Manufacturing Supplies**
- **Technology Refresh**
- **Estimating Software Costs**

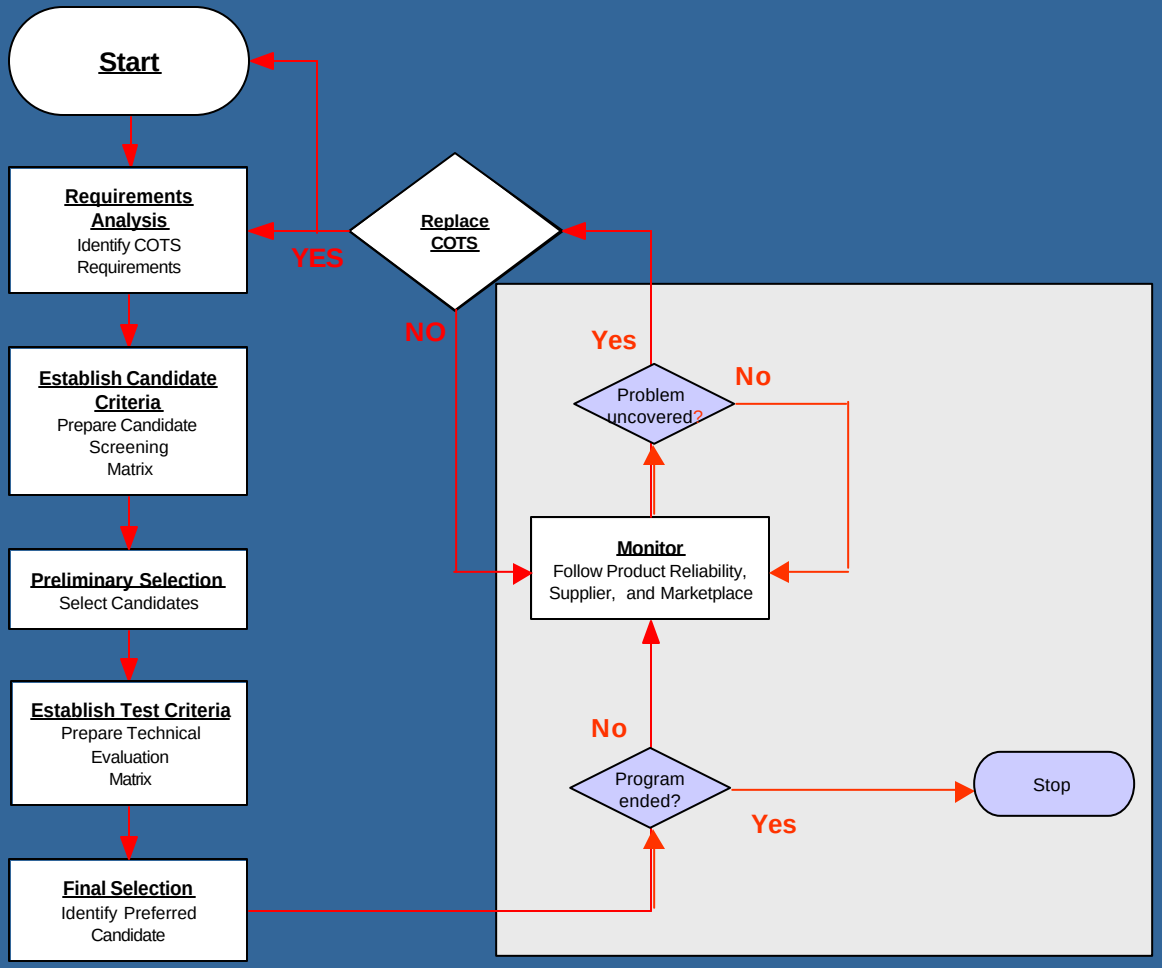
Problems Associated with COTS Software

- **Identifying Compatible COTS Software Releases and Versions**
- **Adverse Supplier Changes**
- **Licenses, Warranties, and Rights**
  - **Copy according to licensing restrictions.**
  - **Identify authorized sites/users of licenses.**

Avoiding Diminishing Manufacturing Supplies Risk

- **Know marketplace and technology**
- **Maintain close working relationship with the supplier**
- **Test all software received**
- **Reject non-conforming software**

Supportability Process Flowchart



Example of Software Component Design Criteria

Software trade name or other identifier	
Type of application	
Equipment/LRU where used	
Operating System	
Sites where used	
Name of this program	

Name	Score	Comment
	1=Unimportant to 5=Critical	
Language		Source code language, if known
Reuse		Name of Program(s) where currently used
Memory usage		Amount of memory for binary
Size of new code required		Amount of new/modified code needed
New code language		Language used to develop new code
Diagnostics		Does COTS component include diagnostics?
Product availability		Is COTS component easily obtained?
Integration complexity		Is COTS component easy to install?
Technology maturity		Does COTS component use proven technology
Pages of documentation		How many pages provided?
Quality of documentation		Is documentation usable?
Architecture		Open Architecture, proprietary or other?
Cost		Cost per installation/Site/Total (?)
Total Score		

Summary

Total Ownership Cost will be reduced if you do the following:

- Assign Supportability Engineers early in the program, before requirements analysis if possible
- Assign Supportability Engineers who are familiar with the host system, the COTS product, and the target hardware
- Select COTS software using a well-defined process that incorporates information about the COTS product, the product's vendor, and historical software metrics

Backup Slides

Example of Software Candidate Selection Criteria

Host Requirement	Evaluator's Weight	Supplier A Rating	Supplier B Rating	Supplier C Rating
Rating	1=Unimportant 5=Critical	1=Weak 10=Strong	1=Weak 10=Strong	1=Weak 10=Strong
Compatible with hardware				
Compatible with software				
CPU usage				
Memory usage				
Protocol compatibility				
Integration difficulty				
Predicted reliability				
Technical documentation				
Supplier financial/ business stability				
Supplier cooperation/ support				
Supplier maturity				
Acceptable licensing terms				
Cost per license/ installation				
Total Scores				

Example of Software Product Evaluation Criteria

Host Requirement	Evaluator's Weight	Supplier A Rating	Supplier B Rating	Supplier C Rating
Rating	1=Unimportant 5=Critical	1=Weak 10=Strong	1=Weak 10=Strong	1=Weak 10=Strong
Performance				
Ease to configure/install				
Documentation quality				
Supplier support quality				
Integration Complexity				
New code requirements				
Number of faults				
Severity of faults				
Total Scores				

Examples of Software Problem and Failure Metrics

Metric Name	Value	Comment
COTS Identifier	Unique identifier	Database Key for this COTS component, when used in this application
Program Name	Name of this program	
Report Identifier	Unique, such as CPCR or TOR number	Record from beginning of Integration through deployment (includes SI&T)
Location	Site where equipment/software installed	
CI and Version	Host CSCI that Failed	
Hardware/LRU	Where CI Executing	Equipment and LRU, "where used"
Problem/Defect Description		
Date and Time	When fault first observed	
Total uptime	Total operating time since COTS installed	
Time since Last Fault	Total operating time since COTS last failed	
Brief Description of Problem	Symptoms	
Severity Code	1=Most severe 5=Least severe	
Operating Scenario	Environment when fault occurred	
Observer Name	Tester or Other	
Time to Install	Time to Integrate, Test, and Run	For new installation/integration, Both estimated and actual For calculating MTTI
Time to Recover	Time to Isolate, Diagnose, Repair, Retest, and Run	For Fault Detection/Correction. For calculating MTTR
Time to Change	Time to correct, or debug, software (source code?)	For installing patch or new version For calculating MTTC